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Research article

Accounting for the Trump factor in modeling the COVID-19 epidemic: the case of Louisiana

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Abstract: Utilizing a SIRE model, I analyze the impact of the 'Trump factor', defined as the ratio of Republican to Democratic voters, in the spread of COVID-19 in the state of Louisiana. The principal findings are these: when the Trump factor is estimated with 2016 State election results, the share of infections peaks at around 40 percent, and the share of expired (deaths) plateaus at around 3.015 percent of the state's population. Utilizing 2020 State election data, the share of infections decreases slightly – to 39 percent – and the share of expired plateaus at 3.018 percent. If the Trump factor is measured utilizing 2020 National election results, the share of infections in Louisiana would only reach 12 percent of the population and the share of expired would stabilize at 2.254 percent, reflecting a decrease in the number of total deaths of roughly 23,459 individuals. An important conclusion is that had Trump shown more interest, and relied more heavily, on the advice of his health experts to make public pronouncements about the pandemic, perhaps the evolution of the virus in the US would not have been as tragic and costly as it has been.

Keywords: COVID-19; SIRE model; Trump factor; Louisiana

1. Introduction

The impact of the COVID-19 pandemic in the United States has been asymmetric. One reason it has been afflicted with the highest number of cases and deaths in the world is that it has among the poorest average health standards of major developed economies [1] exemplified by low life expectancy and the highest levels of health disparities[1]. Another reason is that for the last several years a significant

[1] A 2021 study conducted in partnership between US News and World Report, the BAV Group and the Wharton School of Business of the University of Pennsylvania surveyed more than 17,000 global citizens from four regions to assess

portion of the population has been reluctant to rely on science and expert opinion to base important health care decisions, like accepting- and taking-vaccines for various diseases.

To be sure, there are many other reasons why the coronavirus pandemic has been particularly severe in the US. The preexisting state of the health care system and the inequalities in accessing it; the quality of government response and citizens' trust in government guidance; and how citizens balance individual freedoms to do as they please recognizing that their actions generate externalities. An analysis of how each one of these factors affected the US response to the COVID-19 pandemic will surely take much of health and social scientists' effort for the foreseeable future.

The objective of this paper is to analyze the impact of the 'Trump factor' in the spread of COVID-19 in the state of Louisiana. This factor is certainly related to the pervasive distrust that certain segments of the US population have against science and professional expertise, but it would be unfair to entirely blame Trump for it as this social phenomenon precedes him. Rather, the Trump factor concerns the disdain with which President Trump has often referred to the pandemic. He has repeatedly downplayed, at least in public, the severity of the virus and has made light of efforts to embrace safety guidelines, like wearing masks and social distancing[2]. Coupled with the loyalty and trust that Trump voters have shown towards him, the Trump factor can indeed be an important variable determining the spread of COVID-19 within a community. Though it is difficult to measure the extent of that loyalty and trust, what has become clear since at least 2016 is that individuals who voted for Trump (for the most part, Republican voters) seem to believe what Trump says, regardless of evidence to the contrary, and tend to follow his directives. Evidence of that trust and loyalty is reflected in poll after poll: a recent Pew Research Center poll[3], for instance, finds that sixty-six percent of Republicans believe the coronavirus outbreak has been overblown (only 15% of Democrats believe the same) and, when adjusted for the media platform used to obtain news, seventy-eight percent of Republicans say the coronavirus has been made a bigger deal than it is. Though quantifying the Trump factor is challenging, its importance cannot be ignored hence the need to incorporate it into epidemiological models to measure its impact on the spread of COVID-19.

Utilizing a conventional SIRE (susceptible-infected-recovered-expired) epidemiological model that incorporates the Trump factor variable, I analyze the spread of COVID-19 in the state of Louisiana from March 9, the date of the first reported infection, to December 28 of 2020. A summary of principal findings is this: if the spread of the virus is completely exempt from the Trump factor—the baseline scenario—the peak in infections occurs later; the number of deaths is smaller; and the share of the population who become infected during some period of the epidemic is smaller than what would happen if the Trump factor is incorporated into the model utilizing State election data. When the Trump factor is included in the model utilizing State election data from 2016, the peak of infections occurs

perceptions of 78 countries on 76 different metrics. The *Quality of Life* sub-ranking is based on an equally weighted average of scores from nine country attributes that relate to quality of life in a country, including having a well-developed public health system. The US ranked 20th, below countries like South Korea, Singapore, and Spain and far behind the three leading countries, Canada, Denmark and Sweden. A summary of findings of this study is available here: https://www.usnews.com/news/best-countries/quality-of-life-rankings.

[2] This report outlines some of the consequences of Trump's cavalier attitude towards face masks. https://news.harvard.edu/gazette/story/2020/10/possible-fallout-from-trumps-dismissal-of-face-masks/.

[3] Pew Research Center, October, 2020, "Before Trump Tested Positive for Coronavirus, Republicans' Attention to Pandemic Had Sharply Declined". Available at: https://www.journalism.org/2020/10/07/before-trump-tested-positive-for-coronavirus-republicans-attention-to-pandemic-had-sharply-declined/.

earlier and is higher; the number of deaths is greater, and the share of the population who become infected during some period of the epidemic is higher than the baseline scenario. If the Trump factor is measured utilizing State election data from the recent 2020 national elections, the share of infections is slightly lower and there is no discernible change over the number of deaths with respect to the scenario that utilizes 2016 State election data. However, if the Trump factor is measured with National election data from 2020, there is an improvement in all indicators, including over what is experienced in the baseline scenario.

The principal contribution of this paper rests on incorporating the Trump factor into a conventional epidemiological model to analyze the spread of COVID-19 in a particular setting. Though there have been other attempts to measure the impact of President Trump actions and directives – explicit and implicit – on the evolution of the virus, to my knowledge this is the first time that the Trump factor, measured in terms of election data, is utilized in a SIRE model to assess its impact in the spread of coronavirus in the State of Louisiana.

The rest of the paper is organized as follows. Section 2 presents a short review of the literature; section 3 analyzes the data and the methodology; section 4 reports the principal results, and section 5 concludes.

2. Literature review

The model utilized here is an extension of Kermack and McKendrick [2] seminal work. In addition to the three mutually exclusive stages of infection described in their work—susceptible, infected, and recovered—I add a fourth one, 'expired', to distinguish people in the recovered state that die. Additionally, their basic model is modified by incorporating another variable, the Trump factor, that alters the spread of disease.

A good summary of how Trump and his administration have undermined science is provided by Tollefson [3]. Several non-academic articles have also described how President Trump and his actions have affected the spread of the virus throughout the United States. A sample of those includes Thrush [4]; Nayer [5]; Waldrop and Gee [6]; and Carlisle [7]. Paz [8] provides an unfinished compendium on the misinformation that has emanated from the Trump administration during the time of the pandemic.

More formal papers that have attempted to quantify the impact of Trump on various indicators and aspects of the COVID-19 pandemic include Hahn [9], who, utilizing the epidemiological method of population attributable risk (PAR), estimates the proportion of COVID-19 deaths attributable to President Donald Trump's early pronouncements about voluntary mask use and his intention not to use masks; Bernheim [10] et al., utilizing regression analysis and investigating the effects of large group meetings on the spread of COVID-19 by studying the impact of eighteen Trump campaign rallies; Dave et al., [11], utilizing a difference-in-differences model, and exploring the impacts of a Trump mass campaign rally in the State of Oklahoma on social distancing and COVID-19 spread and finding little evidence that the virus grew more rapidly, or that COVID-19 rates grew faster in counties that drew relatively larger shares of residents to the event; Niburski and Niburski [12], investigating Trump's speeches and Twitter posts, as well as Google searches and Amazon purchases, and television airtime for mentions of hydroxychloroquine, chloroquine, azithromycin, and remdesivir and finding that his actions swayed public purchasing of these chemicals, resulting in undesired effects even though his claims about these products were unverified; Boynton et al., [13] experimentally assessing the effect of message source on perceived message effectiveness (PME) and reactance (an oppositional reaction to a message) and finding that attaching the names of certain political figures to expensive, lifesaving coronavirus messaging efforts may be a missed opportunity to leverage the credibility of public health institutions and can undercut the impact of the messages; and Evanega et al., [14], who identify and analyze the most prominent topics of COVID-related misinformation that emerged in traditional media in a total sample of over 38 million articles published in English-language media around the world and find that the President of the United States was likely the largest driver of the COVID-19 misinformation "infodemic".

As the preceding review suggests, even though a significant number of papers—both academic and non-academic—have analyzed the various ways in which Trump has affected various indicators of COVID-19, to my knowledge, none incorporates a 'Trump factor' into the formal epidemiological modeling of the virus. Furthermore, none focuses exclusively on the State of Louisiana, hence the contribution of this paper which adds to the growing literature of the impact of Trump on the coronavirus pandemic.

3. Data and methodology

3.1. Data

Epidemiological, election, and population data come from the Louisiana Department of Health[4], the Louisiana Secretary of State[5], and the United States Census Bureau[6], respectively. Manipulation of data to obtain the number of susceptible individuals is my own and is based on the number of infected cases and the size of the population. State and Parish data sources are the same.

3.2. Methodology

The baseline SIRE dynamical system consists of four ordinary difference equations describing the evolution of the population in each state over time:[7]

$$s_{t+1} = s_t - \alpha\gamma s_t i_t \tag{1}$$

$$i_{t+1} = i_t + \alpha\gamma s_t i_t - k i_t - \tau i_t$$

$$i_{t+1} = (1 + \alpha\gamma s_t - k - \tau) i_t \tag{2}$$

$$r_{t+1} = r_t + k i_t \tag{3}$$

$$e_{t+1} = e_t + \tau i_t \tag{4}$$

where $s(t)$, $i(t)$, $r(t)$ and $e(t)$ represent fractions of the total population, per time, in the susceptible, infected, recovered, and expired states (or categories), respectively.

With the Trump factor incorporated into the baseline system and letting $\beta = \alpha\gamma$ the difference equations can be restated as:

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[4] https://ldh.la.gov/Coronavirus/.

[5] https://www.sos.la.gov/ElectionsAndVoting/GetElectionInformation/FindResultsAndStatistics/Pages/default.aspx.

[6] https://www.census.gov/quickfacts/LA.

[7] The SIR model presented is based on the description by Tassier [15].

$$s_{t+1} = s_t - \beta TFs_t i_t \tag{5}$$

$$i_{t+1} = i_t + \beta TFs_t i_t - ki_t - \tau i_t$$

$$i_{t+1} = (1 + \beta TFs_t - k - \tau)i_t \tag{6}$$

$$r_{t+1} = r_t + ki_t \tag{7}$$

$$e_{t+1} = e_t + \tau i_t \tag{8}$$

The parameters are defined as follows:

- α denotes the percent of contacts resulting in an infection; also known as the transmission rate.
- γ represents the number of non-infected people contacted by each infected person.
- k represents the fraction of the population that recovers from the disease each period; also known as the recovery rate.
- τ represents the mortality rate of COVID-19.
- and TF represents the Trump factor, estimated by the ratio of Trump voters to Clinton (Biden) voters in the 2016 (2020) elections.

The SIR model (5) to (8) is a bilinear system with four difference equations. The system is positive: all the state variables take non-negative values for $t \geq 0$ if initialized at time 0 with non-negative values. Additionally, it assumes a constant population. The system is compartmental, and therefore the sum of the states (total population) is constant. Because the variables denote population fractions, it is assumed that

$$s_{t+1} + i_{t+1} + r_{t+1} + e_{t+1} = s_t + i_t + r_t + e_t = 1 \tag{9}$$

Note that a country or community is above the epidemic threshold whenever $i_{t+1} > i_t$; from Eq (6), this inequality is equivalent to $\beta TFs_t > k - \tau$, which implies that whenever this inequality holds, a community (*i.e.*, a country) will be above the epidemic threshold and the number of infected individuals in the population will increase. Alternatively, if $\frac{\beta TFs_t}{k-\tau} > 1$, the level of infected individuals increases; if $\frac{\beta TFs_t}{k-\tau} < 1$, the level of infected individuals decreases.

Since at the beginning of the epidemic $s_t \approx 1$, $\frac{\beta TFs_t}{k-\tau} \approx \frac{\beta TF}{k-\tau}$. The latter fraction is known as the Reproduction Number (R_0) and it denotes the average number of people who will contract a contagious disease from one person with that disease. It specifically applies to a population of people who were previously free of infection and have not been vaccinated, hence this number is particularly relevant at the beginning of an epidemic.

Finally, note that, from Eq (6), if $1 + \beta TFs_t - k - \tau < 1$, the epidemic never materializes. Rearranging, the epidemic will disappear if $s_t < \frac{k+\tau}{\beta TF}$. Thus, herd immunity is achieved if $1 - \frac{k+\tau}{\beta TF}$ of the population are recovered and immune.

4. Empirical results

According to the World Health Organization[8], the reproductive number (R_0) for COVID-19—the number of secondary infections generated from one infected individual—is understood to be between

[8] https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200306-sitrep-46-covid-19.pdf?sfvrsn=96b04adf_4.

2 to 2.5. Further, the mortality rate (τ) of the disease is between 3–4 percent[9], which implies that the recovery rate (k) is between 96-97 percent. The average number of contacts of an infective person (γ) is difficult to estimate, especially if one considers the case of individuals who may not know that they have the disease (i.e., asymptomatic cases). If it is assumed that $R_0 = 2.0$, $\tau = 0.030$, $\gamma = 65$[10], and $k = 0.970$, the transmission rate (α) for the baseline scenario is 0.029 ($\frac{R_0 * (k-\tau)}{\gamma} = \alpha$). With these parameters, the trajectory of the disease is reflected in Figure 1, which shows the SIRE baseline model at the aggregate State level for the period from March 9 to December 28, 2020.

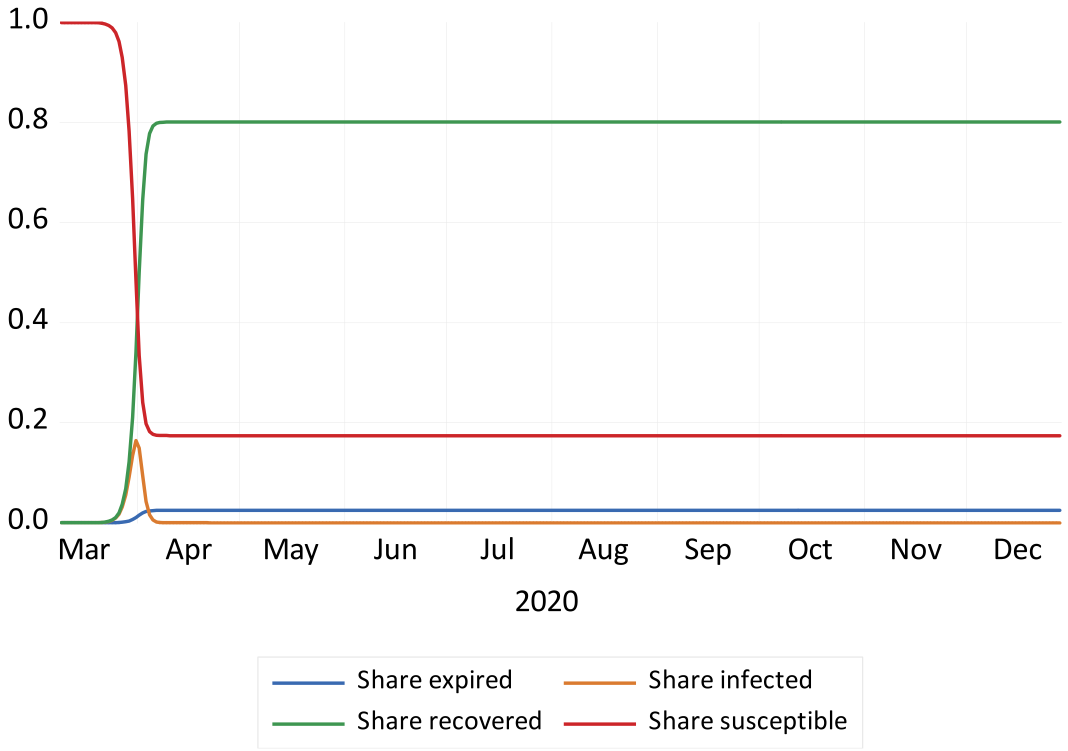

Figure 1. Evolution of COVID-19 in the state of Louisiana: baseline scenario.

The SIRE baseline model predicts that the peak of infections occurs on March 31, when approximately 16 percent of the state's population (766,419 individuals) become infected with the virus. Likewise, on April 11, the share of people who die reaches and plateaus at 2.48 percent (115,698 individuals) of the population[11]. A final prediction of the model is that when the pandemic ends,

[9] The mortality rate is also referred as the 'crude mortality ratio' and is defined as the number of reported deaths divided by the reported cases.

[10] The average number of contacts of an infective individual may plausibly be anywhere between 0 and any positive number. If a 'contact' is understood as any close physical encounter that a person may have with another person at home, school, work, grocery shopping, utilizing public transportation, and/or an infinite number of other common social interactions, any number up to 100 seems reasonable.

[11] The number of deaths predicted by the baseline model (115,698) far exceeds the official number of deaths up to June 30, 2021 (10,732). However, the SIRE model predicts that the share of deaths will remain at approximately 2.48% of the population, which means that, absent the Trump factor, the predicted number of deaths stays at this level while the actual

approximately 80 percent of the population (3,741,063 individuals) will have, at one point or another during the pandemic, been infected with the disease.

The Trump factor is estimated as the ratio of Republican to Democratic voters in the national elections of 2016 and 2020. Because the Republican nominee in both elections has been Donald Trump, the Trump factor is equal to the ratio of $\frac{Trump\ voters}{Clinton\ voters}$ for the 2016 election and $\frac{Trump\ voters}{Biden\ voters}$ for the recent 2020 election.[12] Given the loyalty and trust of Trump voters described earlier and the suspicion with which many of these voters have viewed the COVID-19 epidemic, it is reasonable to assume that as this ratio increases, a larger share of the population is likely to think that the COVID-19 epidemic is not as serious or concerning as portrayed in mainstream media and reputable health protection and medical research institutions like the Centers for Disease Control and Prevention (CDC)[13] and the National Institutes of Health (NIH) [14]. Because these attitudes towards the pandemic affect its evolution, the Trump factor must be accounted for in epidemiological models like the one utilized here to understand its impact on the spread of the virus through time.

An initial assessment of the impact of the Trump factor is captured in Figure 2, where the share of infected individuals is reflected for the baseline model and those scenarios accounting for the Trump factor estimated with 2016 and 2020 State election results. Additionally, it illustrates what the share of infected individuals would have been had the results in the state of Louisiana mimicked the 2020 National election results.

As is evident, the bigger the Trump factor, the larger the share of people infected with COVID-19. When the spread of infected individuals is measured with 2016 State election results (*TF* = 1.513), the peak of infections occurs earlier—around March 23—and reaches 40 percent of the population. As the ratio of Trump to Biden voters decreases slightly in 2020 (*TF* = 1.466), the share of infected individuals decreases as well—to almost 39 percent—highlighting that, in relative terms, voting for Trump can indeed worsen the pandemic plight. Further evidence of the latter is that if the Trump factor is estimated utilizing 2020 National election results (*TF* = 0.912), the peak of infections would have occurred later—around April 4—but, more importantly, only around 12 percent of Louisiana's population would have been infected. The baseline scenario shows that the peak of infections would occur somewhere in between what would happen if the Trump factor is estimated with State elections data (2016 or 2020 data) and the 2020 national data.

An alternative way of evaluating the impact of the Trump factor is by looking at the deaths that may result in different scenarios. Figure 3 illustrates the share of expired (deaths) when the Trump factor is estimated with 2016 and 2020 State election results as well as with 2020 National election results. The baseline case is shown as well.

When the Trump factor is estimated with 2016 State elections data, the share of expired rises faster and plateaus at around 3.015 percent of the state's population (140,822 deaths). With the Trump factor estimated with 2020 State data, the share of expired plateaus at around the same level, 3.018 percent (140,962 deaths), showing a slight increase in the number of total deaths (140 deaths).

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number of deaths increases, closing the gap with the predictions of the model. Moreover, as has been argued in several studies, including in Rossen et al., [16], reported deaths from COVID-19 in the US might underestimate the total number of people who have died from the disease.

[12] Hillary Clinton was the Democratic nominee in 2016 and Joseph Biden in 2020.

[13] https://www.cdc.gov/.

[14] https://www.nih.gov/.

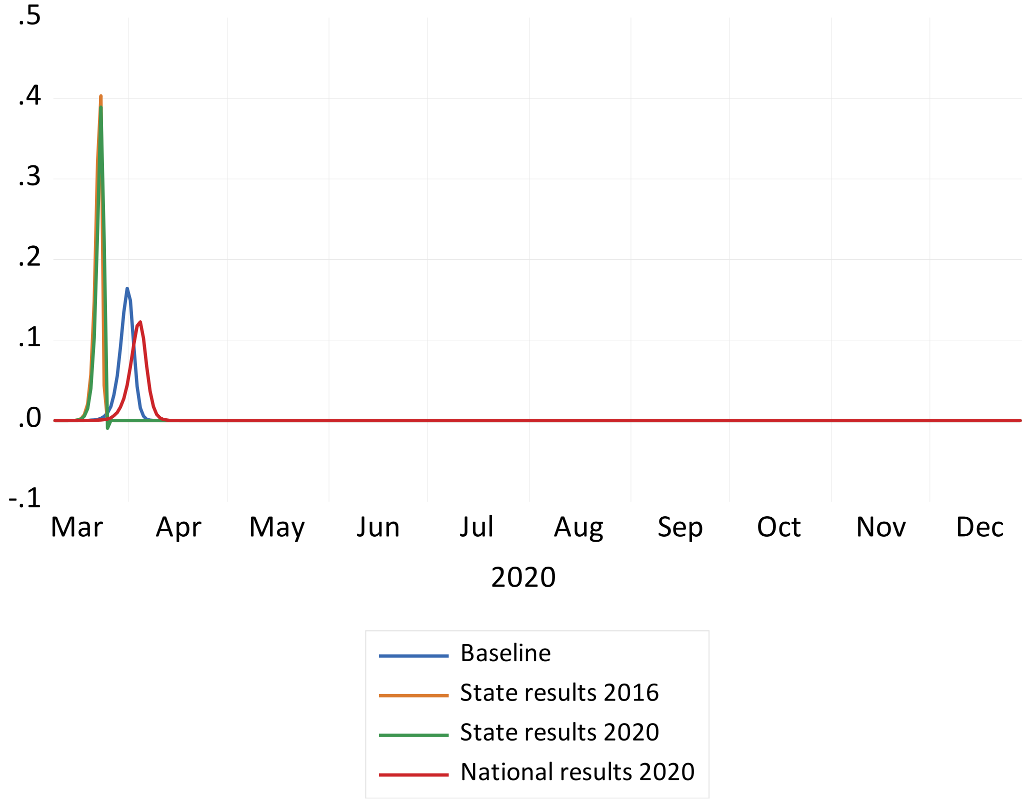

Figure 2. Share of infected individuals.

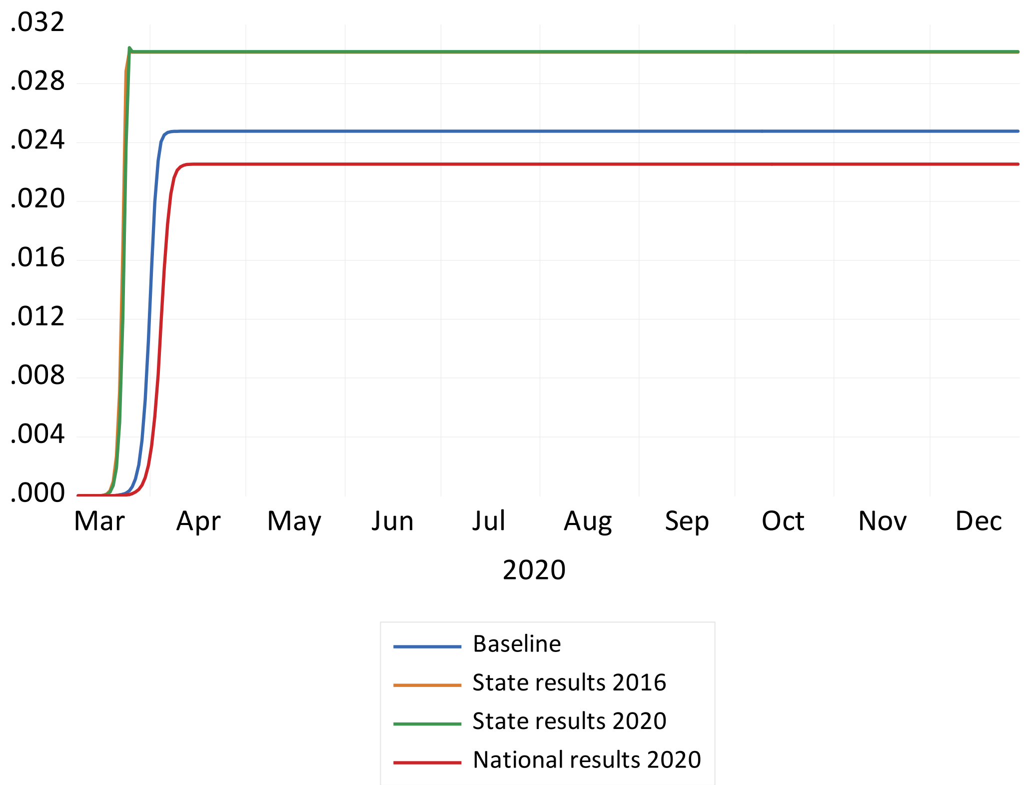

Figure 3. Share of expired (dead) individuals.

If the Trump factor is estimated with 2020 National elections data, however, the rise in the share of expired occurs later and plateaus at 2.254 percent (105,278 deaths), reflecting a substantial decrease in the number of total deaths concerning 2016 data (35,544 deaths). The baseline scenario represents an intermediate case between what would happen with 2016 (2020) State data and 2020 national data.

The implication of the analysis above is that more than 35,000 deaths could have been averted if Louisiana voters had acted like the average national voter and had expressed a greater affinity for the Democratic presidential candidate, as reflected in the 2020 National election results. However, this number—35,544 deaths—represents, at best, a maximum number of total possible prevented deaths since it assumes that every Trump voter views the COVID-19 pandemic as not serious or excessively inflated. This is certainly not the case. If it is assumed, as a Pew Research Center poll reveals,[15] that approximately 66 percent of Republican voters perceive the pandemic as overblown, then a more realistic number of total deaths prevented if the Trump factor is measured utilizing 2020 National election data is 23,459 (= 35,544 * 0.66) [16].

A disaggregated analysis of the deaths that could have been averted (generated) in a sample of parishes in the state of Louisiana is presented in Table 1[17].

Utilizing a SIRE model for each Parish, the number of deaths averted (generated) is calculated by the difference between the maximum number of deaths estimated with 2016 and 2020 State (National) election data, multiplied by 0.66. The key impression from the results reported in table 1 is that as a Parish becomes less Trumpian with respect to the Parish elections in 2016 (i.e., the change in the Trump factor decreases), the number of deaths averted increases or remains at similar levels, pending on the size of the change (columns 4 and 6). Had the 2020 Parish election results mimicked the 2020 National results, however, the change in the Trump factor would have decreased in all cases (column 5) and the number of averted deaths would have been positive and substantial in every Parish in the sample (column 7).

The principal conclusion from the preceding analysis is that, given the assumptions of the SIRE model, voting for Trump can indeed be hazardous to one's health. In the specific case of COVID-19 and focusing on the state of Louisiana, the predictions of the model developed here are that a higher share of infections and a higher number of deaths accompany a population that is relatively tilted in favor of Trump. While this specific finding may not extend to other virus or diseases, what seems to be true is that a combination of blind belief in a leader and suspicion of science and expert opinion, can have very real negative consequences—i.e., externalities, in economics jargon—on the people affected by it.

[15] Pew Research Center, October 2020

[16] An additional finding is that herd immunity with the Trump Factor estimated at 2016 State election results would occur when 64.8% percent of the population is immunized ($= 1 - \frac{k+\tau}{\beta TF}$); 63.7% when the Trump factor is estimated with 2020 State data; and 41.7% if the Trump factor is estimated with 2020 National election data. Herd immunity in the baseline scenario would occur with 46.8% of the population immunized.

[17] Results on the number of deaths averted (generated) for the 64 parishes in the State of Louisiana are available upon request.

Table 1. Number of Deaths Averted (Generated), Selected Parishes.

Parish	Maximum share of expired (Death), 2016 Parish Election Data	Maximum share of expired (Death), 2020 Parish Election Data	Δ in TF_1	Δ in TF_2	Number of deaths averted (generated) with 2020 Parish election data	Number of deaths averted (generated) with 2020 National election data
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Acadia	0.04815	0.06584	0.40988	(2.84014)	(724.40)	1,048.72
Allen	0.05253	0.03138	0.33192	(2.34649)	358.36	508.14
Evangeline	0.04321	0.03704	0.19619	(1.54708)	135.99	455.58
Jefferson Davis	0.05331	0.05612	0.06944	(2.58309)	(58.18)	637.03
Lafayette	0.03803	0.03432	(0.25967)	(1.17159)	598.41	2,498.50
Natchitoches	0.02871	0.02951	0.09910	(0.34353)	(20.15)	155.39
Richland	0.03124	0.02579	0.03072	(1.0786)	72.38	115.54
St. Bernard	0.03113	0.02868	(0.24154)	(1.14822)	76.39	267.85
St. Tammany	0.05177	0.04571	(0.6349)	(2.36574)	1,041.57	5,023.95
West Baton Rouge	0.02902	0.02854	(0.04978)	(0.37613)	8.38	113.19

*Note: Reported values assume a R0 = 2; k = 0.97; γ = 65; and τ = 0.03; transmission rate (α) estimated based on these parameters. 2. Number of deaths averted (generated) = (# of deaths with 2016 Parish data - # of deaths with 2020 Parish (National) data) * 0.66. 3. Δ in TF1 = TF 2020 Parish elections - TF Parish 2016 elections; Δ in TF2 = TF 2020 National elections - TF Parish 2016 elections. 4. Maximum share of expired (Death) with 2020 National election data is 0.02254 in all cases; TF 2020 national elections = 0.91228 in all cases.

5. Conclusions

Utilizing a SIRE model, I analyze the impact of the 'Trump factor' in the spread of COVID-19 in the State of Louisiana. The Trump factor is defined as the ratio of Republican to Democratic voters in the 2016 and 2020 National elections. The principal findings are these: when the Trump factor is estimated with 2016 State election results, the share of infections peaks at around 40 percent, and the share of expired (deaths) plateaus at around 3.015 percent of the state's population. Utilizing 2020 State election data, the share of infections decreases slightly—to 39 percent—and the share of expired plateaus at 3.018 percent. If the Trump factor is measured utilizing 2020 National election results, the share of infections in Louisiana would only reach 12 percent of the population and the share of expired would stabilize at 2.254 percent, reflecting a decrease in the number of total deaths of roughly 23,459 individuals.

While the results reported here depend on the assumptions of the SIRE model, they represent a first approximation to the extent to which Trump affects the spread of COVID-19 in the State of Louisiana. Incorporating the Trump factor into a conventional SIRE epidemiological model is a principal contribution of this paper and adds to the growing literature on how Donald J. Trump and his administration have impacted the COVID-19 pandemic in the United States.

In terms of implications generated by the findings presented here, an essential observation concerns the importance of reliance on facts and science as drivers of health policy. Whether justified or not, a recurring criticism of Donald J. Trump—but not necessarily of other government officials or government institutions—has been his (alleged) dismissal of expert opinion to base decisions that may impact the behavior of voters. Had he shown more interest, and relied more heavily, on the advice of his health experts to make public pronouncements about the pandemic, perhaps the evolution of the virus in the US would not have been as tragic and costly as it has been.

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Conflict of interest

The author declares no conflict of interest in this paper.

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